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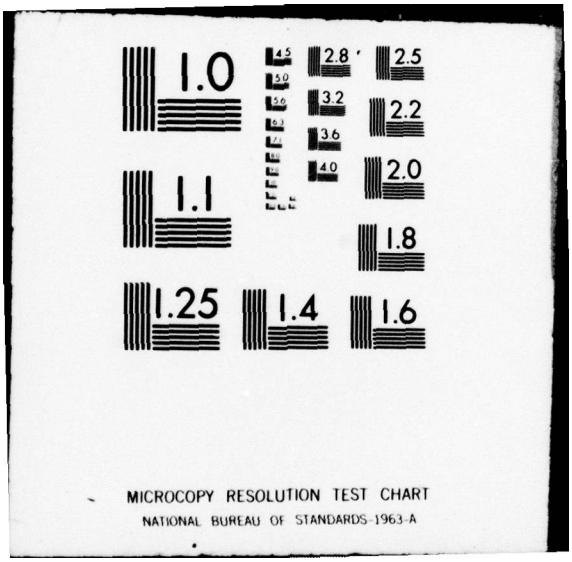
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Monterey, California

THE USE OF JUDGMENTAL DATA IN ROLL CALL ANALYSIS

Edward J. Laurance

June 1978

Final Report for Period October 1976-December 1976

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Prepared for:
Chief of Naval Research, Arlington, VA 22217

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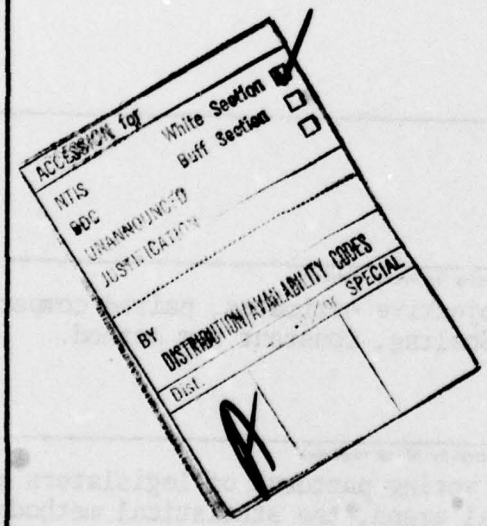

THE USE OF JUDGMENTAL DATA IN ROLL CALL ANALYSIS

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June 1978

ABSTRACT

The Use of Judgmental Data in Roll Call Analysis

Despite the fact that the roll call voting patterns of legislators are being used more frequently in the political arena, the statistical methods employed by political scientists for analyzing roll calls (e.g., Guttman scaling, factor analysis) are not being used. The main reason is the failure to incorporate in a systematic manner the subjective estimates of the political organizations and individuals who must use the output of such analyses. This paper presents two methods, paired comparison and constant sum, which use judgmental data in assessing roll calls. Using a set of seven defense policy roll calls from the 1976 US Senate, the methods are described and compared using two sets of judges.

THE USE OF JUDGMENTAL DATA IN ROLL CALL ANALYSIS

Introduction

The political science discipline is undergoing an obvious change in the direction of policy relevance. Conferences and panels increasingly focus on the utility of much of what we do for public policymakers. New journals explicitly focusing on public policy have emerged. Textbooks on American government now must have "public policy" somewhere in the title. Government funding for research is increasingly contingent on the political scientist demonstrating the payoff of the proposed research for policymaking.

One area in political science where this does not appear to be the case is legislative roll call analysis. It is the purpose of this article: 1) to first show that the use of roll calls in politics is increasing; 2) to demonstrate why most of the research in roll call analysis has not been utilized for policymaking; 3) and put forth several methods for using judgmental data in assessing roll calls which will make this type of analysis more useful in the policy arena.

Increased Importance of Voting In The Political Arena

The use of roll calls to describe the performance of Congressmen in general and on specific issues is not new. For example, the American Federation of Government Employees has rated Congressmen since the 1940s, and the Americans for Democratic Action since 1948. But it wasn't until the early 1970s that the "rating game" swung into high gear and became an important factor in

election campaigns. The key was the shift from the general orientation approach (ADA, Congressional Quarterly's Conservative Coalition, etc.) to one focused on specific issues.

No better example could be given than the impact of the Environmental Action's Dirty Dozen campaign. In 1970, 1972, 1974 and 1976 this group used roll call analysis to identify and publicize the twelve Congressmen with the "worst" anti-environment record. Through 1974, 31 different Congressmen were so identified. Seventeen were defeated in the first year being listed. Five were defeated in subsequent elections. Two retired and seven remain in Congress.[1] In 1976, three of the "dirty dozen" were defeated.

This use of roll calls to pinpoint Congressmen who are performing "poorly" or not in the best interests of certain groups is not limited to the liberal causes such as consumerism and environment. For example, in November 1975 the Atlantic Richfield Company's Civic Action Program (CAP) compiled legislator scores on the energy industry's position based on six key energy votes. The clearly political intent is obvious since they listed only legislators "who represent a substantial number of CAP members."[2] They singled out Rep. Robert W. Edgar (D-PA) for special attention, noting that his

> votes since election can be characterized as being in opposition to the search for and production of additional domestic energy supplies....As a freshman in a competitive political situation and as a newcomer to the complexities of the energy industry, he is a prime candidate for factual information.[3]

Perhaps the most bizarre example of the use of roll calls in the 1976 election campaign was the ratings compiled by the National Alliance of Senior Citizens (NASC) and the National Council of Senior Citizens (NCSC). The NASC "Golden Age Index" rates Congressmen based on votes "perceived most demonstrative of a commitment to fiscal responsibility."[4] Republicans scored exceedingly high in this index. The NCSC index, on the other hand, is concerned more with governmental programs in support of the elderly, such as pension reform and Medicare benefits. Not surprisingly, high scores on this index rarely coincide with high scores on the NASC index. In one heated California debate between two candidates, a liberal incumbent was accused of "not caring about the elderly" based on his NASC (fiscal responsibility) score. Although he was quick to point out his high score on the NCSC index and secure an apology from his opponent, the incident points out not only the increased use of roll call analysis in politics but also the problems which occur when poorly constructed, invalid and misleading indices are essentially misused.

What is required is some sort of quality control of the "rating game." A good example of suggested control is a May 1976 study entitled The Rating Game, published by the House Republican Research Committee. This report recommends a "code of ethics," several parts of which are relevant to the problems of roll call analysis addressed in this article. Their code includes

> an objective, rational and understandable vote selection process, a guarantee of membership input in the determination of the rating group's concerns, detailed vote descriptions, avoidance of percentage compilations, and technical accuracy in description and tabulations.[5]

Political scientists may legitimately ask to what extent the scholarly work on roll call analysis has addressed and perhaps alleviated the problems cited. It is to such an inquiry that we now turn, examining briefly what has been done and its applicability to the policymaking arena.

Roll Call Analysis in Political Science

No attempt will be made to duplicate the several textbooks and articles[6] which adequately survey the field of roll call analysis. However, a brief summary of some of the more commonly used methods will shed some light on the general problem of using this type of analysis for policymaking.

By far the most frequently used method of using roll calls to describe and explain legislative behavior is the simple percentage technique. Specifically, the various Congressional Quarterly indices are the data used in many of the major studies of legislative behavior.[7] This method assumes that each roll call is equally weighted and is an attractive technique since the simple percentage is a ratio measure which facilitates comparison across legislators and time, and can be used in a variety of statistical techniques.

Another popular method is Guttman scaling,[8] especially since the advent of statistical computer packages which facilitate construction of the scales. It has an advantage over simple percentage scales in that it empirically checks for unidimensionality of the roll calls selected. A drawback of this method is that it produces only an ordinal scale. This has not stopped many a political scientist from assuming interval data and proceeding to invalidly use such scales in regression analysis.[9]

One of the disadvantages of the Guttman scaling approach is the limited number of roll calls which can be used to construct a scale (SPSS limits the analyst to 12). Factor analysis[10] is a third method of constructing scales which alleviates this problem. As with the two previous methods, each roll call is equally weighted. The ability to process a greater number of roll calls makes the selection and grouping of roll calls by issue-area somewhat more objective than the Guttman technique, where some sort of subjective sorting process must be used in order to get the number of roll calls to a workable size. It should be added here that a significant amount of academic work has been done comparing the statistical properties and structures of Guttman scale and factor solutions.[11] Warwick's evaluation of the two techniques concludes that factor analysis is

> a refinement over Guttman scaling in the assessment of roll call similarity, although where this extra precision is not required, Guttman scaling remains an acceptable methodology.[12]

There have been several other methods of roll call analysis which have been developed. Specifically, multi-dimensional scaling,[13] cluster-bloc analysis[14] and smallest space analysis.[15] Without judging their future utility in describing or explaining legislative behavior, it can be said that they have not been used to any great extent to this point. In addition, the three methods previously summarized will serve to make the next point in this article, namely that despite their statistical rigor, these methods fall short as techniques which can be utilized in policymaking.

What are the shortcomings of these methods? First, and most crucial to politics, is the selection of issues to make up the indices and scales. In 1976, there were 688 roll call votes in the Senate. If the policy problem is to determine where a senator stands in regard to defense policy, which votes are selected? To use Guttman scaling, a small subset of votes must be selected. As Warwick points out, Guttman scaling is extremely sensitive to the vote splits in each roll call.[16] Out of 30 defense roll calls, 10 may scale, 10 may not, simply based on the Yes-No breakdown on the vote. Factor analysis improves the selection process somewhat, in that it can handle a larger number of roll calls (although not the 688 roll calls in 1976). In my dissertation research I found that factor analysis is more discriminating than Guttman scaling (e.g. some military assistance roll calls appeared in the Guttman scales but formed a distinct cluster when factored.)[17] However, the problem which still remains is insuring that, on any given roll call, a "Yes" is pro--or anti-defense. Was the vote a procedural protest of some sort? Clearly, both Guttman and factor analysis cannot address this problem.

A second problem with the three commonly used methods of roll-call analysis is the assumption that each roll call adds equally to the dimension being measured. Some votes are seminal, others on the same issue are trivial. While these techniques can, over a large set of roll calls, give the general orientation of a legislator, this is not adequate for policy purposes. This is particularly noticeable in the defense issue-area. Senators Cranston and Tunney would come out in any general evaluation as somewhat critical of the Defense

Department. Yet on the several roll calls to cut the B-1 bomber, they were very supportive of continuing the program.

There has been one recent attempt to solve this problem of determining the relative importance of roll calls. Using the House of Representatives as his source of data, Frans Bax has proposed an Index of Importance which

> relies upon the practice of the House to allocate varying amounts of time for debate on legislation coming to the floor....Bills receiving a rule are given a value on the Index equal to the number of hours granted for a debate.[18]

Bax then takes his index and finds that it correlates it with those attributes of legislation that suggest importance--occurrence of a roll call vote on the bill, frequency of roll call votes on the bill, partisan controversy, controversy within committee, number of legislators voting, Presidential involvement, and floor action in the form of amendments to the bill.[19] Bax concludes that his "Index is closely and explicitly linked to the judgments of those House members who are expected to assess the relative importance of many bills."[20]

Bax has overcome some of the obstacles to using roll calls in policy analysis, particularly the problem of constructing unobtrusive measures of importance. But his goal is similar to other approaches in that he is attempting to create a picture of how the House "really" feels about the relative importance of roll calls. His Index of Importance is an important step forward in understanding the House, but does not address the concern of this article. Namely, how can we evaluate the interaction of the Congress with outside groups (interest groups, executive agencies, etc.) using roll call analysis? What the House deems important in defense policy (e.g. lengthy debate on the neutron bomb in

the summer of 1977) may not be as important to the Defense Department, or specific groups within DoD such as the Navy.

The missing ingredient in all the approaches is the expert judgment which must go into both the selection and weighting process. In terms of selection, most organizations constructing voting indices do have a panel which selects votes but rarely do they specify why the votes were selected, and why they are a good indicator of the dimension being measured. This can only lead to increased suspicion that votes are being selected to create a pattern for political gain, a suspicion which leads to little use of the index. Although somewhat general for most policy purposes, the ADA index has been used consistently for many years as a credible index of a liberal voting record. As far as weighting is concerned, little or none is conducted. I think the main reason for this is that in their quest for objectivity, the raters feel that distinguishing the importance of roll calls is blatantly subjective, and hence don't even attempt it. The major problem is that the search for objectivity is a futile one. A legislator does not possess one "objective" attitude toward environmental, defense or farm issues. Rather, there are various versions of this attitude which vary according to the perceptions of the conflicting groups which determine policy in accordance with what Allison has termed bureaucratic politics. If this is how policy is made, and a legislator's voting record is to be used as a measure of previous stances on issue-areas, it is obvious that attention must be paid to how each group views the voting record. This means systematically tapping expert

opinion regarding which votes make up an issue-area, and their relative weight in contributing to the dimension being measured. It is to this task that we now turn.

The Use of Judgment Data In Roll Call Analysis

Having concluded that expert opinion must be systematically measured if roll call analysis is to be used in the political process, we now address specifically how this can be accomplished. The two basic steps involve the selection of votes for a particular issue-area or dimension, and the weighting of those votes in terms of their importance to the group making the index or scale. This article is more concerned with the second step, so the first step of vote selection will be only briefly mentioned. Obviously some sort of Delphi technique could be used to arrive at a consensus as to what votes make up the dimension in question. If such a selection is destined to be the rating organization's view, care must be taken to insure that the judges selected to evaluate roll calls in some way represent the organization and produce a true "party line." How this is done is much more a matter of organizational behavior and beyond the scope of this article.

But once agreement is reached on what roll calls make up a certain dimension, some sort of weighting procedure must be used so that a valid picture of a legislator's record is constructed. Two such procedures were used in this study.

The Method of Paired Comparisons

The basic idea in this method is that a judge can rank any two roll calls as to their relative importance. If the scale being constructed contains n roll calls, each judge will make n(n-1)/2 comparisons. The paired comparison method converts these ordinal judgments into an interval scale. The method is not new, having been in the methodological kits of psychologists since Thurstone spelled out the Law of Comparative Judgement in 1927.[21] There have been many applications of this method in political science[22] but none which address roll call voting. An example from the several experiments conducted during this research will illustrate the method.

Seven Senate roll calls on defense policy were selected by the rating organization (in this case, I selected them for experimental purposes) as indicators of general attitude toward the Defense Department. The judges were given a brief description and background on the vote, along with the recorded results of the vote. They were instructed to assume the role of Secretary of Defense in 1976, and then rank the votes in terms of their importance to you as Secretary of Defense. No ties were permitted. Two groups of judges were used. One was my class in data analysis which had taken two courses, one in international relations and another in American national security policy within the last six months (hereafter referred to as Group NAVAL). The other group was made up of participants in the National Security Education Seminar held each summer at Colorado College, a group with considerably more expertise and knowledge in national security affairs (referred to as Group NSES).

They were given a sheet of paper in the following format:

Most Important _____

_____

_____

_____

_____

_____

Least Important _____

This raw data was then transformed into a matrix as shown in Table 1. The data can be interpreted as follows. There were 4 out of 6 judges who felt vote #12 was more important than #6, while only 1 judge thought #9 was more important than #6.

These raw frequency rankings are next transformed into an array of proportions, in which each cell entry (P_{jk}) is equal to the proportion of times roll call k was judged more important than roll call j. (See Table 2)

The next step involves transforming these proportions into Z scores using the table of normal distribution. The cell entries (Z_{jk}) now equate to the unit normal deviate corresponding to the proportions in Table 2. (See Table 3)

The final step in the process is the computation of a scale score for each roll call, and is also included in Table 3 above. As can be seen, the scale score for each roll call is the mean of each column. While the reader is referred to Torgerson[23] for the theory and assumptions implicit in the technique,

Table 1

Raw Data Matrix For Paired Comparison Technique

(j) \ Roll Call # (k)	6	7	9	12	13	15	16
6	-	1	1	4	1	2	1
7	5	-	3	4	1	3	4
9	5	3	-	4	1	4	2
12	2	2	2	-	2	2	2
13	5	5	5	4	-	4	4
15	4	3	2	4	2	-	3
16	5	2	4	4	2	3	-

Table 2

Proportion Matrix For Paired Comparison Technique

Roll Call (j) \ Roll Call (k)	6	7	9	12	13	15	16
6	-	.20	.2	.667	.2	.333	.2
7	.833	-	.5	.667	.2	.5	.667
9	.833	.5	-	.667	.2	.667	.333
12	.333	.333	.333	-	.333	.333	.333
13	.833	.833	.833	.667	-	.667	.667
15	.667	.5	.333	.667	.333	-	.5
16	.833	.333	.667	.667	.333	.5	-

Table 3

Z Score Matrix For Paired Comparison Technique

Roll Call (j) \ Roll Call (k)	6	7	9	12	13	15	16
6	-	-.841	-.841	.43	-.841	-.43	-.841
7	.965	-	0	.43	-.841	0	.43
9	.965	0	-	.43	-.841	.43	-.43
12	-.43	-.43	-.43	-	-.43	-.43	-.43
13	.965	.965	.965	.43	-	.43	.43
15	.43	0	-.43	.43	-.43	-	0
16	.965	-.43	.43	.43	-.43	0	-
$\frac{1}{n}\sum_{j}^{n} Z_{jk}$	.5514	-.1051	-.0437	.3685	-.5447	0	-.1201

we can and should look at what has been done here. The best way to do this is look at the highest and lowest scores. The roll call with the highest score is #6. It received that score due to the basic fact that in most cases the judges ranked it above all others. Roll call #13 received the lowest score because in most cases it ranked below the other roll calls. Roll call #15 is in the middle of the scale since overall the judges were ambivalent concerning its importance.

The resulting interval scale can be transformed to make it more interpretable. In this case, .5447 was added to each scale score resulting in the following scale of importance for the 7 defense policy roll calls. (See Table 4)

Since these now are interval data, some basic conclusions can be make relative to the importance of the roll calls. Mainly, there appears to be three levels of importance--6 and 12, 15, 9, 7, and 16, and 13. The problem is that very little else can be done with the scale. The purpose behind weighting the votes was to apply them to individual legislators so that a "defense" score could be produced. Since these are interval and not ratio data (i.e., the 0 point is not meaningful since it does not indicate an absence of the dimension), one cannot modify (multiply) a 'Yes' vote by the weight of the roll call. An illustration makes the point. Listed in Table 5 are the results of our experiment so far. Scale A is the original scale, scale B has added +1 to each value. The intervals in both scales are identical. Now we apply both scales to three hypothetical voting records.

Table 4

Defense Support Scale, Paired Comparison Technique

Roll Call #	Subject of Roll Call	Scale Score
6	Cut off funds for B-1	1.0961
12	Conference Report - Defense Procurement	.9132
15	Cut funds for Lance missile	.5447
9	Cut off funds for Minuteman - Auth	.501
7	Delay B-1 decision until Feb 77	.4396
16	Cut off funds for nuclear carrier	.4246
13	Defer decision on Minuteman	.00

Table 5

Adjusted Defense Support Scale, Paired Comparison Technique

Roll Call	Scale A	Scale B
6	1.0961	2.0961
12	.9132	1.9132
15	.5447	1.5447
9	.5010	1.5010
7	.4396	1.4396
16	.4246	1.4246
13	.00	1.00

(+) = pro-defense vote

	6	12	15	9	7	16	13	Score A	Score B
Cong. X	+	+	-	+	+	-	+	2.9499	7.9499
Cong. Y	+	+	-	-	-	-	+	2.0093	5.0093
Cong. Z	-	-	-	-	+	-	-	.4396	1.4396

To see what has happened here, we compare the intervals between Congressmen X and Y, and Y and Z, for both scales A and B. They should be proportional. But they are not.

$$\frac{(2.9499-2.0093)}{(2.0093-.4396)} \neq \frac{(7.9499-5.0093)}{(5.0093-1.4396)}; \quad \frac{.9406}{1.5697} \neq \frac{2.9406}{3.5697}; \quad .5992 \neq .8237$$

While the paired comparison method can shed some light on the relative importance of roll calls to a group of judges, the resulting interval scale cannot be used for the ultimate purpose of rating legislators on a specific dimension.

The Constant Sum Method

The key to the solution of the above problem is to obtain ratio data from those judging the roll calls. Several alternatives exist. The first is to tell the judges to give each roll call a value from 0 to 1.0 such that the final results reflect the ratios among roll calls. If one roll call is .4 and another .8, the latter contains twice as much of the property (e.g. anti-defense) as the former.[24] Experience with this technique has shown that it is very difficult for judges to think in ratio terms, especially with more than a few cases to evaluate.[25] This has led to the so-called "pie allocation" approach,[26] in which judges are given a pie of 100 points, and asked to split it up so that each piece not only has a size relative to all others, but the graphic aspect of the technique gives more assurance that the judges are thinking in ratio terms.

There exists a third alternative, however, which also produces ratio data but puts much less of a demand on the judge. This method is generally termed direct estimation of sense ratios, or more specifically, the constant sum method. As with the paired comparison technique, it is not a new method.[27] The stimuli (in our case the descriptions of the roll calls) are presented to the judges in pairs. The judge is instructed to divide 100 points between them in accordance with the absolute ratio of the greater to the lesser. Although the judge still must think in ratio terms (assigning 80 points to one roll call and 20 to the other indicates the former is 4 times as "important" as the latter), his task is simplified since he only must deal with one ratio at a time. Since the judge does have the opportunity to assign 0 points to a roll call, a natural 0 point in fact exists.

How these raw data are converted into scale scores can best be described by returning to the previous set of roll calls and judges. Having simply ranked the roll calls in importance, the judges were then given the roll calls in pairs and asked to split 100 points between them. They were told that an 80-20 split between a B-1 issue and a nuclear carrier issue would indicate that the B-1 roll call is 4 times as critical to DoD as the nuclear carrier roll call in determining whether a senator is "pro" or "anti" defense.

The first matrix produced (Table 6) is a matrix V in which each cell (V_{jk}) is the average number of points assigned to roll call k when compared to roll call j.

Table 6

Matrix V With Elements Denoting The Average Number Of Points Assigned To Roll Call k When Compared To Roll Call j

Roll Call j \ Roll Call k	6	7	9	12	13	15	16
6	50.0	24.3	27.9	55.7	19.3	32.2	50.0
7	75.7	50.0	52.9	74.7	41.2	51.4	50.3
9	72.1	47.1	50.0	75.0	22.9	50.0	50.8
12	44.3	25.3	25.0	50.0	19.3	27.1	29.3
13	80.7	58.9	67.1	80.7	50.0	59.3	67.1
15	67.9	48.6	50.0	72.9	40.7	50.0	40.0
16	50.0	49.7	49.3	70.7	32.9	60.0	50.0

The next step is to construct a matrix W in which each cell is the ratio of the average points indicated by the column to those indicated by the row (Table 7). $(W_{jk} = \frac{V_{jn}}{V_{kj}})$

The final step involves calculating the geometric means of the columns of the above matrix.[28] The scale values for each roll call (S_j) are calculated using the following equation:

$$\log S_k = \frac{\sum_{j=1}^{n} \log W_{jk}}{n}$$

where n = the number of roll calls.

The actual scale values are the antilogs of the above values, calculated as follows:

$$S_k = \left[\prod^{n} W_{jk} \right]^{1/n}$$

The scale value for roll call 6 is calculated as follows:

$$S_6 = [(1)(3.118)(2.589(.794)(4.184)(2.110)(1)]^{1/7} = 1.78$$

Using the above approach, two sets of scales were constructed; one using the experts from the National Security Education Seminar (NSES) and the other using naval officers from my data analysis class (NAVAL). The following table gives the results of these two experiments. (See Table 8)

In a quick test of the rank orders of the four scales, a non-parametric test (Kendall's tau) was conducted to determine the level of association of the four scales. (See Table 9)

Table 7

Matrix W With Elements Denoting The Ratio Of Average Points Indicated By The Column To Those Indicated By The Row

Roll Call j \ Roll Call k	6	7	9	12	13	15	16
6	1	.321	.386	1.259	.239	.474	1.00
7	3.118	1	1.12	2.958	.699	1.059	1.012
9	2.589	.892	1	.667	.340	1.00	1.028
12	.794	.338	.333	1	.239	.373	.414
13	4.184	1.430	2.937	4.181	1	1.457	2.044
15	2.110	.944	1.00	2.683	.686	1	.667
16	1.00	.988	.972	2.414	.489	1.5	1

Table 8 - Defense Support Scales, Constant Sum Method

Roll Call	NSES (n=6)	NAVAL (n=19)
S_{12} - Conference Report - Defense Procurement	1.826	1.664
S_6 - Cut off Funds for B-1	1.780	1.683
S_{16} - Cut off Funds for Nuclear Carrier	.927	1.098
S_9 - Cut off Funds for Minuteman - Auth	.881	1.082
S_{15} - Cut off Funds for Lance Missile	.880	.688
S_7 - Dalay B-1 Decision Unitl February 77	.746	.736
S_{13} - Defer Decision on Minuteman	.463	.594

Table 9

Rank Order Correlation of Guttman, Paired Comparison And Constant Sum Scales

	Guttman	NSES	NAVAL	Paired Comparison
Guttman	1	.428	.238	.523
NSES		1	.857	.571
NAVAL			1	.523
Paired Comparison				1

The two constant sum scales were highly related, whereas the other relationships were much lower. We have now produced ratio data which not only differentiates each roll call in terms of its importance, but also in a form that can be used in assigning scores (in this case "anti-defense" scores) to individual legislators. Some examples using 1976 votes will demonstrate the use of the various techniques. (See Tables 10 and 11)

In each of the tables, the "Guttman" score is a simple index of the number of anti-defense votes (common practice in most Guttman scale analyses). In Table 10, the scale scores for the "pure" types of senators are listed. The first conclusion drawn is that using tha rank-order scores produced by the Guttman procedure as interval data would be seriously misleading. Second, there are some significant differences when Senator Burdick is rated by the two groups of experts (NSES vs NAVAL). If NAVAL represents either an interest group or governmental bureaucracy which keys their activity to anti-defense activity, they will perhaps be watching Burdick more closely than NSES.

The key conclusions, however, are drawn from Table 11, in which the scores of "mixed" types are listed. It should simply, but significantly, be noted that senators with identical Guttman scores have different NSES and NAVAL scores, and conversely, similar NSES and NAVAL scores produce dissimilar Guttman scores. In the case of mythical Senator C the lower Guttman score produces a higher NSES and NAVAL score. Clearly, the unidimensionality test implicit in Guttman scaling is inadequate in accurately depicting the magnitude of the "anti-defense" dimension for individual senators.

Table 10

Constant Sum Scale Scores For Pure Type Senators

(+) = Anti-Defense Position on Roll Call

Senator	Roll Call Number 12	15	6	9	13	16	7	Guttman Score	NSES Score	NAVAL Score
Buckley	-	-	-	-	-	-	-	0	0	0
Nunn	-	-	-	-	-	-	+	1	.746	.736
Magnuson	-	-	-	-	-	+	+	2	1.673	1.834
Burdick	-	-	-	+	+	+	+	4	3.017	3.510
Hartke	-	-	+	+	+	+	+	5	4.797	5.193
Leany	-	+	+	+	+	+	+	6	5.677	5.881
McGovern	+	+	+	+	+	+	+	7	7.503	7.545

Table 11

Constant Sum Scale Scores For Mixed Type Senators

Senator	Roll Call Number 12	15	6	9	13	16	7	Guttman Score	NSES Score	NAVAL Score
Goldwater	-	-	-	-	-	+	-	1	.927	1.098
Weicker	-	-	-	+	+	-	-	2	1.344	1.676
Percy	-	-	-	+	+	-	+	3	2.090	2.412
Randolph	-	-	-	+	-	+	+	3	2.554	2.755
Schweiker	-	-	+	+	+	-	+	4	3.870	3.964
Cranston	-	+	-	+	+	+	-	4	3.151	3.462
Hatfield	+	-	+	+	+	+	+	6	6.623	6.857
A	-	+	+	+	-	+	-	4	4.416	4.551
B	-	+	-	+	+	-	+	4	2.970	3.100
C	+	+	-	-	-	-	-	2	3.606	3.347
D	-	-	-	+	+	+	+	4	3.017	3.510

Conclusions

The methods put forth in this article are intended to spur discussion and research regarding how roll call data can and should be employed in the policy-making arena. It has been assumed that the bureaucratic politics model accurately explains policy outputs, that policy is a function of bargaining, power and influence. Legislators' votes are a record of their position, and as such form the "previous stances" useful in the bargaining which constitutes politics. This is not to say that there are not serious normative questions concerning the permanent adoption of this model,[29] or that the search for an objective measure using roll calls is not a desirable goal. Rather, what has been said here is that bureaucratic politics is descriptive of how policy is made, roll call analysis (however crude) is part of the currency in such policymaking, and more attention should be paid to designing methods which take into account the selection and weighting of roll calls by experts representative of the organizations involved.

NOTES

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